

1 CLAIMS

2
3 What is claimed is:

- 4
- 5 1. A display system for multimedia content data comprising
- 6 Mathematical Markup Language (MathML) data, said system
- 7 comprising:
- 8
- 9 a display medium having a plurality of display lines for rendering
- 10 multimedia content data thereon;
- 11
- 12 a processor associated with said display medium and configured to:
- 13
- 14 receive said multimedia content data comprising textual, MathML, and
- 15 external file indicia data;
- 16
- 17 parse said received multimedia content data to derive said textual,
- 18 MathML and external file indicia data;
- 19

1 categorize said textual, MathML and file data according to a data
2 type; wherein said textual data is defined as a TEXT data type, said
3 MathML data is defined as a MATHML data type and said external
4 file indicia data is defined as a FILE data type;

5
6 store said derived and categorized textual, MathML and external file
7 indicia data as a tree having a root node and a plurality of offspring
8 nodes that define left and right subtrees, said root node and said
9 offspring nodes each having one of said derived textual, MathML and
10 external file indicia data and respective data type association;

11
12 define a traverse procedure that includes:

13
14 visiting a node of said tree,

15
16 determining the data type of said node;

17
18 displaying said node data in accordance with said data type,
19 wherein:

20

1 if the data type is TEXT: create a text object having said
2 textual node data and locate a display line to display said text
3 object in accordance with predetermined formatting
4 conventions,
5
6 if the data type is FILE: create a file object having said external
7 file indicia node data and locate a display line to load and
8 display said file object in-line with previously rendered text
9 and in accordance with predetermined formatting conventions,
10
11 if the data type is MATHML, create a MathML data object
12 having said stored MathML node data and locate a display line
13 to display said MathML data object in-line with previously
14 rendered text and in accordance with predetermined formatting
15 conventions,
16
17 applying said traverse procedure upon the left subtree of said
18 visited node;
19

1 applying said traverse procedure upon the right subtree of said
2 visited node; and

3

4 applying said traverse procedure upon said root node such that
5 said root node is the first visited node.

6

7 2. A system as in claim 1 wherein said processor further categorizes said
8 MathML data as MATHML COMPOSITE and MATHML
9 TERMINAL data types;

10

11 stores said categorized MathML data as a MathML tree having a root
12 node and a plurality of offspring nodes that define left and right
13 subtrees of said MathML tree, said root node and said offspring nodes
14 of said MathML tree each having one of said derived MathML data
15 and respective data type association;

16

17 defines a second traverse procedure that includes:

18

19 visiting a node of said MathML tree,

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1 determining the MathML data type of said MathML tree node,

2
3 displaying said MathML tree node data in accordance with said
4 data type, wherein:

5
6 if the data type is MATHML COMPOSITE: create a
7 MathML data object having said stored MathML
8 composite node data and locate a display line to
9 display said MathML data object in-line with
10 previously rendered text and in accordance with
11 predetermined formatting conventions, and,

12
13 if the data type is MATHML TERMINAL: create a
14 MathML data object having said stored MathML node
15 terminal node data and locate a display line to display
16 said MathML data object in-line with previously
17 rendered text and in accordance with predetermined
18 formatting conventions,

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1 applying said second traverse procedure upon the left sub-
2 MathML tree of said visited MathML tree node;

3
4 applying said second traverse procedure upon the right sub-
5 MathML tree of said visited MathML tree node; and

6
7 applying said second traverse procedure upon said root node of
8 said MathML tree such that said root node is the *first* visited
9 node of the MathML tree.

10
11 3. The system as in claim 1 or 2 wherein said multimedia content data
12 comprises Markup Language data.

13
14 4. The system as in claim 3 wherein said Markup Language data
15 comprises Extensible Markup Language (XML) data.

16
17 5. The system as in claim 1 or 2 wherein said external file indicia data
18 comprises information associated with data files comprising graphics,
19 video, animation, other displayable assets or a combination thereof.
20

1 6. The system as in claim 4 wherein said data files are Macromedia or
2 Flash-compatible files.

3

4 7. A method of displaying multimedia content data comprising
5 Mathematical Markup Language (MathML) data, said method
6 comprising:

7

8 providing a display medium having a plurality of display lines for
9 rendering multimedia content data thereon;

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11 receiving said multimedia content data comprising textual, MathML,
12 and external file indicia data;

13

14 parsing said received multimedia content data to derive said textual,
15 MathML and external file indicia data;

16

17 categorizing said textual, MathML and file data according to a data
18 type; wherein said textual data is defined as a TEXT data type, said
19 MathML data is defined as a MATHML data type and said external
20 file indicia data is defined as a FILE data type;

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storing said derived and categorized textual, MathML and external

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file indicia data as a tree having a root node and a plurality of offspring

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nodes that define left and right subtrees, said root node and said

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offspring nodes each having one of said derived textual, MathML and

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external file indicia data and respective data type association;

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8

defining a traverse procedure that includes:

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visiting a node of said tree,

11

12

determining the data type of said node;

13

14

displaying said node data in accordance with said data type,

15

wherein:

16

17

if the data type is TEXT: create a text object having said

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textual node data and locate a display line to display said text

19

object in accordance with predetermined formatting

20

conventions,

1

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if the data type is FILE: create a file object having said external

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file node data and locate a display line to load and display said

4

file object in-line with previously rendered text and in

5

accordance with predetermined formatting conventions,

6

7

if the data type is MATHML, create a MathML data object

8

having said stored MathML node data and locate a display line

9

to display said MathML data object in-line with previously

10

rendered text and in accordance with predetermined formatting

11

conventions,

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13

applying said traverse procedure upon the left subtree of said

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visited node;

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16

applying said traverse procedure upon the right subtree of said

17

visited node; and

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19

applying said traverse procedure upon said root node such that

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said root node is the first visited node.

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8. The method as in claim 7 wherein said method further comprises

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categorizing said MathML data as MATHML COMPOSITE and

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MATHML TERMINAL data types;

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storing said categorized MathML data as a MathML tree having a root

7

node and a plurality of offspring nodes that define left and right

8

subtrees of said MathML tree, said root node and said offspring nodes

9

of said MathML tree each having one of said derived MathML data

10

and respective data type association;

11

12

defining a second traverse procedure that includes:

13

14

visiting a node of said MathML tree,

15

16

determining the MathML data type of said MathML tree node,

17

18

displaying said MathML tree node data in accordance with said

19

data type, wherein:

20

1 if the data type is MATHML COMPOSITE: create a
2 MathML data object having said stored MathML
3 composite node data and locate a display line to
4 display said MathML data object in-line with
5 previously rendered text and in accordance with
6 predetermined formatting conventions, and,
7
8 if the data type is MATHML TERMINAL: create a
9 MathML data object having said stored MathML node
10 terminal node data and locate a display line to display
11 said MathML data object in-line with previously
12 rendered text and in accordance with predetermined
13 formatting conventions,
14
15 applying said second traverse procedure upon the left sub-
16 MathML tree of said visited MathML tree node;
17
18 applying said second traverse procedure upon the right sub-
19 MathML tree of said visited MathML tree node; and
20

1 applying said second traverse procedure upon said root node of
2 said MathML tree such that said root node is the first visited
3 node of the MathML tree.

4
5 9. The method as in claim 7 or 8 wherein said multimedia content data
6 comprises Markup Language data.

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8 10. The method as in claim 9 wherein said Markup Language data
9 comprises Extensible Markup Language (XML) data.

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11 11. The method as in claim 7 or 8 wherein said external file indicia data
12 comprises information associated with data files comprising graphics,
13 video, animation, other displayable objects or a combination thereof.

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15 12. The method as in claim 11 wherein said data files are Macromedia
16 Flash or Flash-compatible files.

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1 13. A user interface for presenting question and answer multimedia data
2 comprising mathematical MathML content, said system comprising:
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4 a processor configured to:
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6 receive said multimedia data comprising textual, MathML and external
7 file data;
8
9 parse said received multimedia data to derive said textual, MathML
10 and external file data;
11
12 generate question content and associated answer, visual aid and
13 descriptive solution content based on said derived textual, MathML
14 and external file data;
15
16 display first, second, third and fourth display containers on said
17 display device, said first display container including a presentation
18 area for displaying said question content; said second display container
19 including a presentation area for displaying said answer content; said
20 third display container including a presentation area for displaying said

1 visual aid content; said fourth display container including a
2 presentation area for displaying said descriptive solution content; and
3
4 wherein for each of said first, second, third and fourth display
5 containers said MathML and external file data of said container
6 content are displayed in-line with said textual data of said container
7 content.
8

9 14. The user interface as in claim 13 wherein said external file data
10 includes graphics, video, animation, other displayable objects or any
11 combination thereof.
12

13 15. The user interface as in claim 13 or 14 wherein said multimedia data
14 comprises Markup Language data.
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16 16. The user interface as in claim 15 wherein said Markup Language data
17 comprises Extensible Markup Language (XML) data.
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